REMARKS

Claims 1, 3-12, 14-16, 19, 21-34, 36-41 and 43-44 are pending. Claim 44 is new.

Amendments to the Claims

Claim 1 has been amended to specify that the flow control insert is for a downhole string including a shoe. Basis for this amendment can be found in claim 4 as originally filed and in Fig 1, which shows a control insert (cement tool 10) inside a casing string 60 which includes a shoe 14.

Claim 1 has also been amended to specify that the control insert is formed separately from the downhole string. Basis for this amendment can be found in page 15, lines 8 to 16 of the application as filed, and in Figs 5 and 6, which show that the cement tool 10 is formed completely separately from the casing string 60.

Claim 1 has also been amended to specify that the flow control insert is adapted to be inserted within the downhole string above the shoe. Basis for this amendment can be found in Fig 1, which shows the shoe 14 at the very bottom end of the casing string 60, and that the flow control insert (cement tool 10) is within the casing string 60, above the shoe 14.

Claim 1 has been amended for clarity and conciseness, to remove the term "decelerating means", since the two different nouns "flow control insert" and "decelerating means" are not both required. The function of the flow control insert to decelerate the fluid still remains in the claim.

Claim 1 has been amended to remove the requirement for the decelerating means to comprise a passage which includes an axial portion at each of its ends. Basis for this amendment can be found in claim 1 as originally filed. This present amendment simply retracts an amendment introduced in our first response, so that claim 1 reverts more closely its form as originally filed.

Claims 4 to 10, 25, 27-29, 31, 32, 41 and 43, have been amended in conformity with the amendments to claim 1.

Claims 14 and 16 have been amended for clarity, as requested by the Examiner.

Claims 17, 18 and 42 have been cancelled.

Claim 26 has been altered in a minor way, to replace the word "means" with "device".

New claim 44 has been added. New claim 44 corresponds to claim 43, except that claim 44 does not have a requirement for two axial ends. Basis for this can be found in claim 1 as originally filed, which also did not include a requirement for two axial ends.

It is respectfully submitted that no new matter has been added.

35 USC 112 Claim rejections

Claims 14, 18 and 34 were rejected under 35 USC 112.

Claim 14 has been amended to clarify that it is only the spiral portion of the passage that has the constant dimensions.

Claim 18 has been cancelled.

Claim 34 is dependent on claim 32. Claim 32 specifies a passage which is inclined relative to the conduit axis. It is clear that this relates to a spiral portion of the flow control insert 10, since the axial ends shown in the drawings are not inclined with respect to the conduit axis. Hence, the "inclined passage" of claim 34 can only mean the spiral portion of the flow control insert 10, and there is no contradiction with the spiral portion having constant dimensions.

Reconsideration and withdrawal of the rejections of claims 14 and 34 are respectfully requested.

35 USC 102 Rejections in view of Baker (US 2,178,846)

Claims 1, 3-11, 15-17, 25, 26, 28, 31-33, 36, 39, 42 and 43 were objected to under 35 USC 102(b) as being anticipated by Baker.

Claim 1 has now been amended to specify that the downhole string includes a shoe and that the flow control insert is adapted to be inserted within the downhole string above the shoe.

In contrast, Baker's spiral member (body member 15) is not inserted within a downhole string above a shoe. Baker's body member 15 is instead located in the lower end of a shoe. Specifically, the body member 15 is located in the lower end of a cement plug of the shoe. Therefore, the body member 15 is not above the shoe.

Thus, amended claim 1 is novel over Baker.

35 USC 103: Non-obviousness of amended claim 1

A technical advantage of a flow control insert of amended claim 1, is that it can be used to control the flow of fluid through a downhole string, and in particular, to decelerate this fluid.

The present invention achieves this by locating a flow control insert within a downhole string above a shoe of the downhole string. The flow control insert provides a restriction in the flowpath, which induces turbulence into the fluid, thereby decelerating the fluid.

This can be understood by considering the effects of turbulence. Usually, if the pressure of fluid going into a passage is increased, there is a consequential increase in the *speed* of the fluid coming out of the passage. However, if the passage induces turbulence into the fluid, the turbulence creates a back pressure which restricts the flow, and the fluid will reach a terminal velocity after which point, no matter how much greater the pressure becomes, the speed of the fluid coming out of the passage does not increase any further.

In some uses of the present invention, both drilling mud and cement pass through the apparatus. The drilling mud and cement are decelerated as they pass through the flow control insert. The reduction in speed of the cement reduces the likelihood of cement falling through the drilling mud (see page 22, lines 11 to 14 of the application as filed). The

reduction in speed of the drilling mud eases the pressure on the formation, rendering the formation less likely to collapse (see page 30, lines 18 to 23 of the application as filed).

In contrast, Baker's well cementing tool is for a completely different purpose. Neither the desirability of decelerating the cement, nor the desirability of decelerating the drilling mud, nor the problem of cement falling through the drilling mud, nor the problem of reducing the pressure on the formation is recognised in Baker. The purpose of Baker's spiral passage is to cause the cement to continue to travel in a spiral motion as it emerges from the bottom of the tube, ensuring equal distribution of the cement in the well bore (see column 1, lines 36 to 45 of Baker).

It was never intended for Baker's tool to decelerate fluid, as evidenced by the location of the spiral body member 15 within the cement plug of the shoe. Cement shoes are fairly small pieces of equipment which guide the path of the casing in the wellbore. Baker's body member 15 is only about a quarter of the size of the cement shoe 10. Hence, Baker's spiral body member 15 can only be around 0.15 meters in length, which is inadequate for any appreciable deceleration to occur.

Furthermore, Baker's spiral portion is very loosely wound so that the slope is steep, giving a fast flowpath not greatly varying from the axial direction. Hence, it is clear that deceleration of fluids was never intended and the skilled person finds no motivation in Baker to desire to decelerate the cement or the drilling mud, or to solve the problems of cement falling through the drilling mud or how to prevent the formation breaking down under high pressure from the drilling mud.

A further technical advantage of the present invention is that the most suitable flow control insert (or combination of inserts) can be selected to provide the required amount of deceleration for each particular circumstance. This is achieved by forming the flow control insert separately from the downhole string and locating the flow control insert above the shoe. In the illustrated example, the flow control insert is located in "the shoe track", which comprises the casing joints immediately above the shoe.

The amount of deceleration required depends on the height of the downhole string. The taller the string, the higher the pressure of the fluid at the lower end of the string after

falling the length of the string under both gravity and the pressure from the fluid above. The higher the pressure of the fluid at the lower end of the string, the greater the deceleration required. The greater the deceleration required, the longer the flow control insert should be to achieve this deceleration. With the present invention, the downhole string and the shoe can be manufactured as is conventional. Before the downhole string is run into the wellbore, a flow insert of the required height (or a plurality of flow inserts of the required total height) is inserted in the downhole string, which is then run into the wellbore and used. Hence, the present invention has the advantage that, on manufacture, the flow control insert is not permanently attached to any part of the downhole string, including the shoe. Thus, the invention can be used with conventional downhole strings and with conventional shoes, instead of requiring a specially adapted piece of equipment (e.g. an adapted casing joint and/or a shoe) that can only be used for one particular height of downhole string.

A person of ordinary skill in the art would not be tempted to modify Baker such that the flow control insert is in a drillstring above a shoe, because:

1) Baker is not concerned with providing a means of decelerating fluid passing through a downhole string;

2) Baker's apparatus is a well cementing shoe and does not include any apparatus above the shoe itself;

3) Baker's spiral body member 15 cannot be moved from its present position within the cement nose 11 of the shoe 10, because if it were moved, it would not longer be able to impart a spiral motion to fluid leaving the shoe and hence the spiral portion would no longer ensure equal distribution of the cement around the shoe. Thus, if the body member 15 is removed from Baker's cement shoe and moved to a location above the shoe, the very purpose of Baker's cement shoe is no longer achieved; and

4) Moving the spiral body member 15 to a location above the shoe would bring no advantage to Baker's tool, because the body member 15 is only around 0.15 meters in length, so no significant deceleration could be achieved.

Considering the other prior art cited by the Examiner, US 6,311,774 (Brockman) is not relevant to claim 1, since there is no flow control insert comprising a passage including a

spiral portion that is adapted to be inserted within a downhole string. Instead, Brockman's spiral formations 72 are located on the outside of a downhole string (the casing 70), see Fig 7. Hence, there is certainly no such flow control insert located above a shoe. Furthermore, it is not possible for Brockman's spiral formations 72 to decelerate flow of fluid through the downhole string 70, since the formations 72 are exterior to the downhole string 70.

US 6,723,158 (Brown) relates to a gas separator, which is not a flow control insert, is not suitable for insertion in a downhole string, does not disclose a downhole string with a shoe, and is not adapted to decelerate the flow of fluid through a downhole string. A person of ordinary skill would not seek to combine the two entirely different technical fields of Baker's downhole cement shoe with Brown's wellbore-external gas separator, because equipment for separating gases on the earth's surface is certainly not suitable for use within a downhole string, at immense fluid pressures, at the bottom of a wellbore. For a start, the consequences of anything breaking are entirely different. If your gas separator breaks down, you repair it or substitute it for another, with relatively little risk or difficulty. If a cement shoe breaks, the integrity of a well may be lost, the well might become dangerous and/or irrecoverably useless, at a loss of millions of dollars.

US 5,346,007 (Dillon) relates to a particular design of float shoe 19 and, like Baker, does not disclose a flow control insert that is adapted to be inserted within a downhole string above a shoe (e.g. the float shoe 19). Furthermore, Dillon does not disclose either any need to decelerate fluid or a flow control insert adapted to decelerate fluid and that comprises a passage including at least one spiral portion.

Thus, even combining Baker with Brockman, Brown or Dillon, a person of ordinary skill would not be able to arrive anywhere close to the present invention, and many features of claim 1 are not disclosed in any of these documents. In the case of Brockman and Brown, these disclosures cannot be reasonably combined with Baker in any realistic and meaningful way. In the case of Dillon, any combination with Baker does not lead any closer to the present invention. Hence, reading Brockman, Brown or Dillon together with Baker only leads a person of ordinary skill in the art still further away from the present invention.

Therefore, amended claim 1 is non-obvious.

Independent claims 29, 31, 43 and 44

The remaining independent claims 29, 31, 43 and 44 all share the novel and non-obvious feature of claim 1 that the flow control insert is adapted to be positioned within a downhole string above a shoe of the downhole string.

Hence, claims 29, 31, 43 and 44 are also novel and non-obvious, for the same reasons as explained above with respect to claim 1.

Additionally, claim 29 also specifies a valve located in the string above the apparatus, the cross-sectional area of the passage being greater than the cross-sectional area of the valve. Since Baker only discloses the cement shoe itself, there is no disclosure in Baker of any equipment located above the shoe, no disclosure of any valves in such equipment, and no disclosure of ensuring the cross-sectional area of the passage should be greater than such cross-sectional area of such a non-existent valve. The Examiner's reference to Dillon does not lead a person of ordinary skill unambigously to claim 29, because Dillon's passage 17 (cited by the Examiner) is the casing string, and is not a passage in a flow control insert located in a downhole string, as required by claim 29. Hence, claim 29 is still novel and non-obvious, even in the light of Baker combined with Dillon.

Additionally, claims 43 and 44 specifically include the downhole string and shoe as part of a claimed assembly.

Additionally, claim 43 specifies the passage has two axial ends. Applicant respectfully disagrees with the Examiner's assertion that Baker's device has two axial ends. As shown in Fig 1, Baker's body member 15 is spiral along its entire length. Even if the tube 14 were considered to be an upper axial end, there is no lower axial end to Baker's passage. Instead, Baker's body member 15 terminates at the tip of the shoe 10. Furthermore, Baker explains that the purpose of the body member 15 is to impart a spiral motion to fluid leaving the shoe to ensure an equal distribution of cement. Such spiral motion could not occur if, as the Examiner is suggesting, Baker's cement shoe had a spiral passage with two axial ends. Specifically, if Baker's spiral passage had an axial lower end, this would cause fluid to emerge from the shoe in an axial path, and not in a spiral path. Hence, it is clear both from

Fig 1 and from Baker's explanation of the spiral motion, that Baker does not and cannot possibly have a flow control insert comprising a passage with two axial ends.

A person of ordinary skill in the art would never wish to modify Baker's body member to provide two axial ends, because then it would not longer be able to impart a spiral motion to fluid leaving the shoe, resulting in an unequal distribution of cement. Thus, if the body member 15 were moved upwards in Baker's cement shoe to provide a second axial end, the very purpose of Baker's cement shoe is no longer achieved.

The Dependent Claims

Claims 3-12, 14-16, 19, 21-28, 30, 32-34 and 36-41 are all dependent on one of the abovementioned independent claims. Hence, these claims are also novel and non-obvious, at least by virtue of their dependencies.

Request for Allowance

It is thus believed that the application is now allowable and notification to this effect is earnestly solicited. Should the Examiner have any questions or comments regarding Applicants' amendments or response, he is asked to contact Applicants' undersigned representative at (215) 988.3303. Please direct all correspondence to the below-listed address. If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-0573.

Respectfully submitted,

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